Docket 14249

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Peter Hagerlid		
Appln. No.:	09/719,960	Group Art Unit:	1655
Filed:	June 14, 2001	Examiner:	B. Sisson
Title:	REACTION MONITORING SYSTEM		

RESPONSE TO OFFICE ACTION

Commissioner for Patents
Washington, D.C. 20231

I hereby certify that this document is being sent via First Class U. S. mail addressed to: Commissioner for Patents, Washington, D.C. 20231 on this 16th day of December, 2002.

Janet M Maulbert
(Signature)

Sir:

This paper is in response to the Office Action mailed July 24, 2002 for the above-identified application. Applicants request a two-month extension of time for responding to the Office Action, and enclose a check in the amount of $400 in payment of the fee under 37 C.F.R. § 1.17(a)(2). Please enter the following amendment and consider the following remarks.

IN THE SPECIFICATION:

After the claims, please insert the attached separate page containing the ABSTRACT OF THE DISCLOSURE.

IN THE CLAIMS:

Please cancel Claim 26 without prejudice.

Please amend the claims as follows:

--23. (Thrice Amended) An apparatus for simultaneously monitoring an array of reaction sites for light indicating that a reaction is taking place at a particular site, comprising:

a sample receptacle for receiving a plurality of liquid samples at said array of reaction sites;

a dispenser arranged for dispensing at least one reagent into said samples on said sample receptacle;

a single optically sensitive transducer arranged so that in use the light emitted from a particular plurality of samples at said array of reaction sites will impinge upon corresponding predetermined regions of said optically sensitive transducer;

a light intensity level determination device in connection with said optically sensitive transducer for simultaneously determining the level of light intensity impinging upon each of said predetermined regions; and

a recorder in connection with said light intensity level determination device to record the variation of said light intensity level with time for each of said liquid samples.--

--28. (Amended) An apparatus as claimed in Claim 23, comprising an array of lenses between, or arranged in use between, said reaction sites and the optically sensitive transducer.--

--30. (Amended) An apparatus as claimed in Claim 23, wherein the optically sensitive transducer comprises a charge-coupled device.--

--31. (Amended) An apparatus as claimed in Claim 30, wherein the optically sensitive transducer comprises a frame transfer charge-coupled device.--

--33. (Amended) An apparatus as claimed in Claim 23, comprising means to convert the electrical output from said optically sensitive transducer into a digital signal--

--46. (Amended) An apparatus for identifying target bases in DNA sequences comprising:

a plate for receiving a plurality of liquid samples at respective reaction sites;

a dispenser arranged for dispensing at least one reagent into said samples on said plate;

a single optically sensitive transducer arranged so that in use light generated by the reaction of a plurality of particular liquid samples on said plate signifying the incorporation of a nucleotide will impinge upon corresponding predetermined regions of said optically sensitive transducer;

a light level determination device in connection with said optically sensitive transducer for simultaneously determining the level of light impinging upon each of said predetermined regions; and

a recorder in connection with said light level determination device for recording the variation of said light level with time.--

REMARKS

In the Office Action mailed July 24, 2002 for the above-identified application, the specification has been objected to for failing to contain an abstract. The application has been amended to include a separate page containing an abstract. No new matter has been added. Withdrawal of the objection is respectfully requested.

Claims 23, 24, 26-39 and 46 have been rejected under 35 U.S.C. § 103(a) as allegedly rendered obvious by U.S. Patent No. 5,104,621 to Pfost et al. ("Pfost et al.") in view of U.S. Patent No. 6,263,095 to Rushbrooke et al. ("Rushbrooke et al.") and U.S. Patent No. 6,214,246 to Craighead ("Craighead"). The Examiner has alleged that Pfost et al. teach a device comprising a plate for receiving sample receptacles, dispensing means to deliver a sample and for reagents, illumination means, optical detection means and data storage and analysis means. Rushbrooke et al. allegedly disclose the use of a charge coupled device (CCD) to detect, measure and evaluate light signals resulting from various chemical/biological assays. Craighead allegedly discloses a device comprising an array of reaction sites where simultaneous readouts are obtained for a plurality of reaction sites. The Examiner has alleged that it would have been obvious to modify the device of Pfost et al. so as to detect, measure and evaluate light signals a plurality of times in a simultaneous manner.

Applicants respectfully submitted that the subject matter of Claims 23, 24, 26-39 and 46 is not rendered obvious by the combination of the cited references.

In accordance with the present invention, the claimed device is arranged such that a light emitted from a plurality of samples at an array of reaction sites impinges upon a single optically sensitive transducer. Claims 23 and 46 have been amended to clarify this feature, and claim 26 has been cancelled without prejudice. Claims 28, 30, 31 and 33 have been amended to depend properly from claim 23. As disclosed in the present specification at page 4, lines 35-37, this feature, whereby multiple reaction sites are monitored by a single transducer, minimizes the complexity of the device, and allows a more compact design.

None of the cited references, either alone or in combination, teach or suggest an apparatus arranged so that light from multiple samples impinges upon a single optically sensitive transducer, thereby allowing "many-to-one mapping." In the device of Pfost et al. the optical transducer must be moved between reaction sites, see, e.g., Pfost et al. at Col. 6, l. 41 – Col. 7, l. 13. Similarly, Rushbrooke et al. fail to teach the simultaneous monitoring of a plurality of reaction sites using a single optically sensitive transducer. The Examiner cites Craighead as disclosing "a device comprising an array of reaction sites where simultaneous readouts are obtained for a plurality of said reaction sites." In this embodiment of Craighead, simultaneous readout is possible "[s]ince each of the channels preferably has its own illumination optics, its own collection optics and its own detector." Craighead at Col. 8, l. 9-11.

Even if one of ordinary skill in the art had been motivated to modify the device of Pfost et al. to detect simultaneous readouts for a plurality of sites as allegedly taught by Craighead, the proposed combination of the cited references would result in a device having a multiplicity of optically sensitive transducers, i.e., a device having a transducer for each of a plurality of reaction sites. In contrast, the apparatus of the present invention is configured such that light emitted from multiple reaction sites impinges upon a single optically sensitive transducer. Accordingly, the apparatus of the present invention is neither taught nor suggested by the prior art, nor does the combination of cited references achieve the presently claimed invention.

In addition, none of the cited references, alone or in combination, teach or suggest an apparatus having a means for recording the variation of light intensity level over time for each sample. Rushbrooke et al. disclose that coordinates from a succession of interrogations of the same sample may be stored in an accumulation store and produced as a list. However, there is no teaching or suggestion in Rushbrooke et al. to record the time at which a particular light emission is recorded, and thus no means to record the variation of light intensity level over time.

Further, one would not have been motivated by the cited references to make a device that records the variation of light intensity over time. The device of Pfost et al. is used to determine optical density of a sample; the device of Rushbrooke et al. is used to detect the presence of a labeled material in a sample; the device of Craighead measures fluorescence of electrophoresed

DNA fragments. None of these methods requires determination of variation of light intensity over time, and thus one would not have been motivated to include a means for recording such variation. In contrast, the device of the present invention provides a means for recording variation of light intensity level with time, and thus is useful, for example, in a sequencing by synthesis method as disclosed in the present specification at page 4, lines 12-22.

Accordingly, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the cited references. Even if one were motivated to combine the references, the combination fails to achieve the present invention. Withdrawal of the rejection under 35 U.S.C. § 103(a) is respectfully requested.

In view of the foregoing comments and amendments, favorable reconsideration and allowance of Claims 23, 24, 27-39 and 46 is earnestly solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Marked-up Version Showing Changes**."

Respectfully submitted,

DORSEY & WHITNEY LLP

Date: December 16, 2002

By: 

Janet M. MacLeod
Reg. No. 35,263
250 Park Avenue
New York, NY 10177
(212) 415-9200